PM_{10} SIP/Maintenance Plan Evaluation Report: University of Utah

Salt Lake County Nonattainment Area

Utah Division of Air Quality

Major New Source Review Section

October 1, 2015

PM_{10} SIP/MAINTENANCE PLAN EVALUATION REPORT
U of U Campus

1.0 Introduction

This evaluation report (report) provides Technical Support for Section IX, Part H.1 and Section IX, Part H.2 of the Utah Maintenance Plan; to address the Salt Lake County PM_{10} Nonattainment Area. This document specifically serves as an evaluation of the University of Utah (U of U) Campus located in Salt Lake County.

Note on document identification: The intention of the Utah Division of Air Quality is to develop a Maintenance Plan to address PM_{10}. As part of this effort, SIP Subsections IX.H.1 Emission Limits and Operating Practices – General Requirements, IX.H.2 Source-Specific Particulate Emission Limitations in Salt Lake and Davis Counties and IX.H.3 Source-Specific Particulate Emission Limitations for Utah County will be repealed and replaced. Subsection IX.H.4 will be repealed and replaced with Interim Emission Limits and Operating Practices. This subsection provides interim limits, consistent with the limits codified in the $PM_{2.5}$ SIP, until future controls have been implemented within timeframes identified in Section IX Part H.2.

These SIP Subsections were adopted by the Air Quality Board on July 6, 2005 and became state law on August 1, 2005. However, this version of the SIP was not adopted by EPA and therefore never became federal law. Thus, this evaluation report also references an earlier SIP version originally dated June 28, 1991. This SIP was adopted by EPA and published in the federal register on July 8, 1994. This earlier SIP version is often referred to as the "original SIP." In order to distinguish between the various documents in this report, a coding scheme will be used:

- Since Section IX.H of the 2005 State-only SIP will be repealed entirely, there is no need to refer to that document version within this report.
- When referencing the original SIP (the one issued in 1991/1992 and adopted by EPA in 1995), the qualifier $^{\{OS\}}$ will follow any citation from that document.
- When referencing any new SIP condition or requirement, the citation will be left blank.

Therefore, a particular sentence of this document might read as follows:

SIP Subsection IX.H.1.c – Stack Testing supersedes 2.a.A$^{\{OS\}}$ from the original SIP.

1.1 Facility Identification

Name: University of Utah – Main Campus
Address: 200 South University Ave Salt Lake City, Utah, Salt Lake County
Owner/Operator: University of Utah
UTM coordinates: 4,512,800 m Northing, 429,440 m Easting, Zone 12

1.2 Facility Process Summary

The University of Utah (U of U) provides the full range of services normally found at a large university. Emissions from U of U are primarily due to the operation of: boilers, comfort heating

equipment, and emergency generators. Two boilers located at the central heating plant are subject to 40 CFR 60 Subpart Db, Standards of Performance for Industrial-Commercial-Institutional Steam Generation Units and one is subject to 40 CFR 60 Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units. 40 CFR 63, Subpart JJJJJJ, National Emission Standards for Hazardous Air Pollutants for Industrial-Commercial-Institutional Boilers Area Sources applies. Certain emergency power generation engines are subject to 40 CFR 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines and 40 CFR 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

1.3 Facility Criteria Air Pollutant Emissions Sources

The following is a listing of the main emitting units from the U of U Campus:

- Building 302, Upper Campus Heating Plant
  Three NSPS boilers (1, 2 and 3). These boilers all have 15% flue gas recirculation, and are fired on natural gas and diesel as a backup fuel. Rating for each boiler is up to 87.5 MMBtu/hr.
- Building 303, Lower Campus Heating Plant
  One pre-NSPS boiler (3) that use natural gas only and at up to 105 MMBtu/hr.
  Four NSPS Boilers (4a, 4b, 5a and 5b) that use natural gas, each rated up to 50 MMBtu/hr.
- Building 303 (Cogeneration Unit).
  One natural gas-fired turbine with duct burner rated at 85 MMBtu/hr. Gas turbine and duct burner are Subject to NSPS, 40 CFR, Part 60, Subpart KKKK.

This is not meant to be a complete listing of all equipment which may be involved or required during permitting activities at the U of U Campus, rather it is a listing of all significant emission units or emission unit groups.

1.4 Facility 2011 Baseline Actual Emissions and Current PTE

In 2011, the U of U Campus baseline actual emissions were determined to be the following (in tons per year):

Table 1: Actual Emissions

Pollutant	Actual Emissions (Tons/Year)
PM_{10}	13.69
SO_2	0.68
NO_x	63.02

The current PTE values for the U of U, as established by the most recent AO issued to the source (DAQE-AN103540025-13) are as follows:

Table 2: Current Potential to Emit

Pollutant	Potential to Emit (Tons/Year)
PM_{10}	19.29
SO_2	3.85
NO_x	100.05

2.0 Demonstration of Maintaining Attainment

These values have been used in the modeled attainment demonstration. The 2011 actual emissions were used as baseline for model validation. The U of U Campus emissions were projected for future years using growth factors for the manufacturing industry in Salt Lake County. Those emissions projected with growth are intended to represent future actual emissions for the U of U Campus.

Although a specific application of new RACT is not a requirement of the maintenance plan, the limitations found within this maintenance plan are based on the most recent $PM_{2.5}$ Section of the SIP. This Section of the SIP required the application of RACT above and beyond the existing controls already required of most listed PM_{10} SIP sources – including the U of U Campus in specific. The conditions, requirements and emission limitations contained within this maintenance plan are based on those in Sections IX.H.11, IX.H.12 and IX.H.13 – which comprise the $PM_{2.5}$ sections of the SIP, and include this additional RACT application. All requirements from the original PM10 SIP that have not been superseded or replaced, and which are still necessary will also be retained. By necessary, meaning: needed in the demonstration of attainment of the 24-hour standard, or in demonstrating that no backsliding in the application of RACT has taken place. This is discussed in greater detail in Item 3 below.

3.0 Comparison of Requirements – Original SIP and New Maintenance Plan

The U of U is a previously listed SIP source. In the original PM_{10} SIP document for Davis and Salt Lake Counties [IX.H.2 Emission Limitations and Operating Practices (Davis and Salt Lake Counties) – dated 28 June 1991$^{\{OS\}}$, the U of U was listed in Subsection IX.H.2.b.YY$^{\{OS\}}$ as University of Utah – Salt Lake City: (Hot Water Plant). As a listed source there were several requirements and conditions that applied to the facility.

In addition, the U of U is also a listed source in the $PM_{2.5}$ Section of the SIP (see SIP Section IX.H.12.t). As was discussed above in Item 2.0, all limits in this maintenance plan are based on the limits in the $PM_{2.5}$ SIP; either in the general requirements of subsection IX.H.11 or the source specific requirements of IX.H.12.n.i. Therefore, a comparison between the original SIP requirements, and those found in this new maintenance plan can be found below:

3.1 Original SIP General Requirements

IX.H.2.a General Requirements$^{\{OS\}}$

The original SIP was a divided document, having two separate sets of General Requirements. The requirements found at IX.H.1.a$^{\{OS\}}$ applied to the listed sources found in Utah County, while those found at IX.H.2.a$^{\{OS\}}$ applied to the listed sources found in Salt Lake and Davis Counties. As the then the U of U Campus was located in Salt Lake County, only the general requirements of IX.H.2.a$^{\{OS\}}$ applied. However, except for the additional requirements found under IX.H.2.a.M$^{\{OS\}}$ for petroleum refineries and the specific fuel requirements of IX.H.2.a.N$^{\{OS\}}$, the two subsections are essentially identical.

2.a.A. Stack Testing$^{\{OS\}}$ – this subsection covered the general methods and procedures for conducting stack testing, including the establishment of a pretest protocol, pretest conference, and the use of specific EPA test methods. This subsection has since been updated and superseded by

SIP subsection IX.H.1.e which incorporates equivalent language.

2.a.B. Visible Emissions{OS} – covered the establishment of designated opacity limitations for specified process units and/or process equipment. This subsection has since been superseded by SIP subsection IX.H.1.f which serves the same which incorporates equivalent language.

2.a.C. Visible Emissions (cont.){OS} – covered the procedure by which visible emission observations would be conducted. This subsection has since been superseded by SIP subsection IX.H.1.f which incorporates equivalent language.

2.a.D. Annual Emission Limitations{OS} – established that annual emissions would be determined on a rolling 12-month basis, and that a new 12 month emission total would be calculated on the first day of each month using the previous 12 months data. This subsection is no longer needed as the annual PM_{10} standard no longer exists.

2.a.E. Recordkeeping Requirements{OS} – established that records need to be kept for all periods that the plant is in operation, for a period of at least two years, and provided upon request. This subsection has since been superseded by SIP subsection IX.H.1.c which incorporates equivalent language.

2.a.F. Approval Orders{OS} – established that this subsection of the SIP superseded any previously issued AOs. No longer applicable, as this subsection of the SIP will be superseded, and no previously issued AOs are still in existence.

2.a.G. Proper Maintenance{OS} – established that all facilities need to be adequately and properly maintained. Not needed. This is inherent in the NSR permitting program.

2.a.H. Future Modifications{OS} – established that future modifications to the approved facilities were also subject to the NSR permitting requirements. Not needed. This is inherent in the NSR permitting program.

2a.I. Unpaved Operational Areas{OS} – established rules for treating fugitive dust with water sprays or chemical dust suppression.

2.a.J. Actual Emissions{OS} – established that the actual emissions included for each listed source in subsection IX.H.2.b would not be used for compliance purposes. This subsection is no longer needed as a listing of individual source actual emissions are no longer included in the requirements of subsection IX.H of the SIP. This requirement is outdated and obsolete.

2.a.K. Test if Directed{OS} – established a definition of this term. No longer needed as this term is no longer used and the condition itself no longer applies. UDAQ has a minimum test frequency established under R307-165-2. This same rule also allows for (and requires) any additional testing to demonstrate compliance status as deemed necessary by the Director.

2.a.L. Definitions{OS} – established that the definitions contained in R307 apply to Section IX.H.2. This subsection has since been superseded by SIP subsection IX.H.1.b which incorporates equivalent language.

2.a.N. Specific Fuel Requirements for Coal and/or Oil{OS} – established that specific rules for the sulfur content of these fuels also existed and applied. This subsection has since been superseded

by the individual source requirements found in IX.H.2 and IX.H.3 (see specifically the sources Kennecott and BYU). This requirement is now, largely irrelevant as few sources have the ability or authority to burn coal, and the rules on the sulfur content of fuel oil have been updated with lower sulfur requirements – specifically the requirements on the sulfur content allowed in diesel fuel found under 40 CFR 80.510(c) for off-highway diesel and 40 CFR 80.520(a) for on-highway diesel. None of the listed sources have the ability to burn any other fuel oils.

3.3 Original SIP Source Specific Requirements

The U of U is in the process of upgrading their Lower Campus Heating Plant with the removal of Units 4 and 5 (each rated at 105 MMBTU/hr) and replacing each of them with two units that are each rated at 50 MMBTU/hr. The new boilers will be ultra-low NO_x and are each rated at 9 ppm NO_x.

Individual source requirements:

2.b.YY.1.$^{\{OS\}}$ This subsection was a listing of the equipment at the U of U – this subsection has been superseded and is irrelevant. A simple listing of equipment does not constitute an emission limitation, does not impose any restriction on daily emissions, and rapidly becomes out of date as well as impossible to enforce. The original listing found in this subsection will be replaced and would represent a significant step backwards in emission control.

2.b.YY.2.$^{\{OS\}}$ This subsection set the stack testing limits and the frequencies for the five coal and natural gas combustion units in the Lower Campus High Temperature Heating Plant (Building 303). They were listed as Boiler #1, #2, #3, #4 and #5. The use of coal was discontinued in the 1990's. At the present time all of the units at the U of U burn natural gas as a primary fuel. The units (#1 and #2), each rated at 60 MMBTU/hr, in Building 303 at the Lower Campus High Temperature Heating Plant (LCHTWP) were removed from service in 2007. A cogeneration unit, natural gas fired turbine with waste heat recovery unit (WHRU), was installed to replace the two boilers.

Unit 5 (105 MMBTU/hr and 187 PPM NO_x) in Building 303 has been removed and is being replaced with two ultra-low NO_x boilers (50 MMBTU/hr each and 9 PPM NO_x). Unit 4 will be replaced by 2018 with two ultra-low NO_x boilers (50 MMBTU/hr each and 9 PPM NO_x). Unit 3 will be only used in a stand-by status after Units 4 and 5 have been replaced.

These items represent large capital investments with significant lead times, engineering, construction, startup, shakedown and testing involved. This date was reached through negotiation with the source based on the source's expected construction schedule after consideration of each factor. The requirements in the subsection are outdated and will be replaced with requirements that will be adjusted to the upgrades. Therefore, this subsection is irrelevant.

2.b.YY.3.$^{\{OS\}}$ This subsection limited the use of natural gas for firing the boilers from November 1 to February 1. It also limited the coal consumption and the natural gas consumption. These are annual limits and the PM_{10} annual standard has been rescinded. Therefore, this subsection is irrelevant.

2.b.YY.4.$^{\{OS\}}$ This subsection sets limits on the sulfur content of coal. The U of U no longer burns coal as a fuel. Therefore, this subsection is irrelevant.

2.b.YY.5.$^{\{OS\}}$ This subsection prohibits flash re-injection. The U of U no longer burns coal as a

fuel. Therefore, this subsection is irrelevant.

2.b.YY.6.{OS} Annual Emissions – established total annual emissions for the U of U Campus. As shown in Table 3 below, the emissions from the U of U plant will be significantly reduced after the boilers are replaced (Units 5 & 6) or upgraded (Unit3 1-34). Therefore, the annual emission estimations have been eliminated. Salt Lake County has not shown an exceedance in over ten years and the reduction in allowable emissions will demonstrate a prevention of backsliding.

Table 3: Potential to Emit

Pollutant	Potential to Emit (Tons/Year)
Current PM_{10}	19.29
Current SO_2	3.852
Current NO_x	100.05
Original SIP PM_{10}	74.3
Original SIP SO_2	219.3
Original SIP NO_x	245.8

4.0 New Maintenance Plan – General Requirements

The general requirements for all listed sources are found in SIP Subsection IX.H.1. These serve as a means of consolidating all commonly used and often repeated requirements into a central location for consistency and ease of reference.

IX.H.1.a. This paragraph states that the terms and conditions of Subsection IX.H.1 apply to all sources subsequently addressed in the following subsections IX.H.2 and IX.H.3. It also clarifies that should any inconsistency exist between the general requirements and the source specific requirements, then the source specific requirements take precedence.

IX.H.1.b States that the definitions found in State Rule 307-101-2, Definitions, apply to SIP Section IX.H. Since this is stated for the Section (IX.H), it applies equally to IX.H.1, IX.H.2 and IX.H.3.

IX.H.1.c This is a recordkeeping provision. Information used to determine compliance shall be recorded for all periods the source is in operation, maintained for a minimum period of five (5) years, and made available to the Director upon request. As the general recordkeeping requirement of Section IX.H, it will often be referred to and/or discussed as part of the compliance demonstration provisions for other general or source specific conditions.

IX.H.1.d Statement that emission limitations apply at all times that the source or emitting unit is in operation, unless otherwise specified in the source specific conditions listed in IX.H.2 or IX.H.3.

This is the definitive statement that emission limits apply at all times – including periods of startup or shutdown. It may be that specific sources have separate defined limits that apply during alternate operating periods (such as during startup or shutdown), and these limits will be defined in the source specific conditions of

either IX.H.2 or IX.H.3.

Conditions 1.a, 1.b and 1.d are declaratory statements, and have little in the way of compliance provisions. Rather, they define the framework of the other SIP conditions. As condition 1.c is the primary recordkeeping requirement, it shall be further discussed under item 4.2 below.

IX.H.1.e This is the main stack testing condition, and outlines the specific requirements for demonstrating compliance through stack testing. Several subsections detailing Sample Location, Volumetric Flow Rate, Calculation Methodologies and Stack Test Protocols are all included – as well as those which list the specific accepted test methods for each emitted pollutant species (PM_{10}, NO_x, or SO_2). Finally, this subsection also discusses the need to test at an acceptable production rate, and that production is limited to a set ratio of the tested rate.

These stack testing requirements supersede those found in IX.H.1.a.$A^{\{OS\}}$ and IX.H.2.a.$A^{\{OS\}}$ of the original SIP.

IX.H.1.f This condition covers the use of CEMs and opacity monitoring. While it specifically details the rules governing the use of continuous monitors (both emission monitors and opacity monitors), it also covers visible opacity observations through the use of EPA reference method 9.

These requirements specifically supersede those found in IX.H.1.a.$C^{\{OS\}}$ and IX.H.2.a.$C^{\{OS\}}$ of the original SIP. The original SIP requirements of IX.H.1.a.$B^{\{OS\}}$ and IX.H.2.a.$B^{\{OS\}}$, both of which addressed individual equipment opacity, will be superseded as necessary by the particular source specific limitations found in IX.H.2 or IX.H.3.

Both conditions 1.e and 1.f serve as the mechanism through which sources conduct monitoring for the verification of compliance with a particular emission limitation.

4.1 Monitoring, Recordkeeping and Reporting

As stated above, the general requirements IX.H.1.a through IX.H.1.f primarily serve as declaratory or clarifying conditions, and do not impose compliance provisions themselves. Rather, they outline the scope of the conditions which follow – the source specific requirements of IX.H.2 and IX.H.3.

For example, most of the conditions in those subsections include some form of short-term emission limit. This limitation also includes a compliance demonstration methodology – stack test, CEM, visible opacity reading, etc. In order to ensure consistency in compliance demonstrations and avoid unnecessary repetition, all common monitoring language has been consolidated under IX.H.1.e and IX.H.1.f. Similarly, all common recordkeeping and reporting provisions have been consolidated under IX.H.1.c.

4.2 Discussion of Attainment Demonstration

As is discussed above in Items 4.0 and 4.1, these are general conditions and have few if any specific limitations and requirements. Their inclusion here serves three purposes. 1. They act as a framework upon which the other requirements can build. 2. They demonstrate a prevention of backsliding. By establishing the same or functionally equivalent general requirements as were included in the original SIP, this demonstrates both that the original requirements have been

considered, and either retained or updated/replaced as required. 3. When a general requirement has been removed, careful consideration was given as to its specific need, and whether its retention would in any way aid in the demonstration of attainment with the 24-hr standard. If no argument can be made in that regard, the requirement was simply removed.

5.0 New Maintenance Plan – University of Utah Specific Requirements

The boilers in the 1994 PM_{10} SIP were listed as Boiler No. 1 (60 MMBTU/HR), Boiler No. 2 (60 MMBTU/HR), Boiler No. 3 (105 MMBTU/HR), Boiler No. 4 (105 MMBTU/HR), and Boiler No. 5 (105 MMBTU/HR). Boilers 1 and 2 are located in Building 302 of the Upper Campus High Temperature Heating Plant (UCHTHP). Boilers 3, 4 and 5 are located in Building 303 of the Lower Campus High Temperature Water Plant (LCHTWP).

Currently in the AO (DAQE-AN103540025-13 dated Sept 30, 2013) and Title V (dated May 20, 2015), the boilers are referenced as follows:
Building 302 (UCHP) three boilers rated up to 87.5 MMBTU/hr.
Building 303 (LCHP), two pre-NSPS boilers (3 & 4) each rated up to 105 MMBTU/hr and two NSPS boilers (5 & 6) each rated up to 50 MMBTU/hr.

Boilers 3, 4 and 5 in Building 303, were each originally rated at 105 MMBTU/hr. The U of U has replaced Boiler No. 5 with two 50 MMBTU/hr boilers (5a & 5b), and has removed Boiler No.4. Boiler No. 4 will be replaced with two boilers that are each rated at 50 MMBTU/hr. During the $PM_{2.5}$ SIP process, to avoid confusion on the replacement of the boilers (3, 4 and 5), it was decided that the boilers replacing 4 would be renamed 4a and 4b and the boilers replacing 5 would be named 5a and 5b. If Boiler No. 3 is replaced the replacement boilers will be named 3a and 3b.

IX.H.2.l.i This sets NO_x limits for Units 3, 4a, 4b, 5a and 5b. These limits will result in a significant reduction from the original SIP limits. Condition H.1.d of the general conditions requires the limits to apply at all times.

During the development of the $PM_{2.5}$ SIP, it was determined that the emissions from the boilers in Building 302 (Units #1, #2 and #3) did not warrant a RACT analysis. They were already equipped with low NO_x burners and flue gas recirculation and each had an actual NO_x emission rate in the 2008 emissions inventory of 4.2 tpy. In order to meet the $PM_{2.5}$ SIP RACT, the U of U upgraded the boilers with an O_2 trim system to reduce NO_x emissions. It was not economically feasible to require an SCR or SNCR for these boilers. Their low NO_x emission rate coupled with the reduction in NO_x emissions from the installation of the O_2 trim systems, did not warrant a stack testing requirement.

IX.H.2.l.ii This condition establishes stack test frequencies for the Units 3-5 and the turbine at every three years. Condition H.1.e.H of the general conditions requires testing to be conducted at 90% of the production rate achieved in the previous three (3) years.

The turbine is a natural gas-fired turbine that has a well-established and well-understood emission rate that does not vary over the short-term. Stack-testing on this unit is established primarily to address long-term maintenance issues and to demonstrate that the unit's overall performance has not degraded with extended use. A once-every-three-year stack test is sufficient for this demonstration.

IX.H.2.l.iii This condition requires that Unit 3 be used only as a back-up/peaking boiler. It

may only be operated for 300 hours per year. If it is operated longer than 300 hours, then it will be required to be upgraded to low NO_x burners.

These items represent large capital investments with significant lead times, engineering, construction, startup, shakedown and testing involved. This date was reached through negotiation with the source based on the source's expected construction schedule after consideration of each factor.

5.1 Monitoring, Recordkeeping and Reporting

Monitoring for all three emission points is addressed through stack testing. As appropriate, these monitoring requirements are complemented by the general provisions of IX.H.: 1.e for stack testing, and 1.c for recordkeeping and reporting.

5.2 Discussion of Attainment Demonstration

Generally, the calculation methodology for determination of emissions from the U of U Campuse is identical to the method used in during the 1991/1992 timeframe of the original SIP. However, several key differences exist:

1. Emissions in the new maintenance plan are lower or equal to the original SIP

As is shown above in the tables above, the emissions PM_{10}, SO2 and NO_x emissions from the U of U Campus have dropped significantly.

2. Condensable emissions, which were excluded from the original SIP, are included in the new maintenance plan

The original SIP was based on filterable PM_{10} emissions only. The new maintenance plan includes both filterable and condensable PM_{10} emissions.

6.0 Implementation Schedule

All RACT imposed limits are in place. After January 2019, boiler #3 can only be operated as a back-up boiler, unless it has been retrofit with controls that provide for RACT compliance.

7.0 References

- U of U Campus, $PM_{2.5}$ SIP Major Point Source RACT Documentation
- UDSHW Contract No. 12601, Work Assignment No. 7, Utah $PM_{2.5}$ SIP RACT Support – TechLaw Inc.
- U of U AO DAQE-AN103540025-13
- U of U Campus Title V 3500063003

UTAH PM_{10} SIP/MAINTENANCE PLAN

Salt Lake County Nonattainment Area

Supporting Information